TRANS-MARINA ROAD - PHASE II - PRELIMINARY SOIL REPORT

HAWAII KAI, OAHU, HAWAII
TAX MAP KEY: 3-9-08: 1

To:
PARK ENGINEERING, INCORPORATED

WALTER LUM ASSOCIATES, INCORPORATED
CIVIL, STRUCTURAL, SOILS ENGINEERS
AUGUST 18, 1970

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
EDWARD WATANABE
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2020 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

August 18, 1970

PARK ENGINEERING, INC.
Room 710, 1149 Bethel Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: Trans-Marina Road - Phase II
Preliminary Soil Report
Hawaii Kai, Oahu, Hawaii
Tax Map Key: 3-9-08: 1

Submitted herewith is our preliminary soil report for design purposes for Trans-Marina Road - Phase II at Hawaii Kai, Oahu, Hawaii.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf

C O N T E N T S

TRANS-MARINA ROAD - PHASE II - PRELIMINARY SOIL EXPLORATION

HAWAII KAI, OAHU, HAWAII
TAX MAP KEY: 3-9-08: 1

SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for design purposes for the proposed Trans-Marina Road - Phase II and for the design of foundations for a 12-in. sewer line along the roadway at Hawaii Kai, Oahu, Hawaii.

FIELD EXPLORATION AND LABORATORY TESTS

Thirteen exploratory borings were made along the proposed road alignment. The locations of these borings and six nearby borings made previously for Trans-Marina Road Bridge - Phase II are shown on Figure 1, Boring Location Plan. Descriptions of the underlying soils are shown on Boring Logs Nos. 1 thru 13. Also attached are the logs of six borings made for the Trans-Marina Road Bridge - Phase II soil report.

The borings were made with 3 and 4-in. diameter augers using tungsten carbide drag bits. Soil samples were recovered with a 2-in. standard split spoon sampler driven by a 140-lb hammer falling 30 inches.

Laboratory tests included: natural water content, Atterberg limits, sieve analysis, expansion and CBR. A summary of the laboratory test results is given in Tables IA thru IE.

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE LOCATION

The proposed Trans-Marina Road - Phase II extends from Kalanianaole Highway across Kuapa Pond in a northeasterly direction to Hawaii Kai Drive just south of Kaluanui Ridge, a distance of about 3,700 ft.

The roadway alignment is mostly over an existing coral fill across Kuapa Pond. The profile along the proposed roadway is rather level (about elevations 7 to 9 ft) with a waterway crossing across the highway at about 2,100 ft from the beginning of the project at Kalanianaole Highway.

INTERPRETATION OF SOIL CONDITIONS

From the field exploration, most of the soils encountered in the borings may be generally described as follows:

A surface layer about 5 to 10 ft of medium to dense fill over loose clayey sand with coral fragments to about 18 to 25-ft depths or more.

Near Hawaii Kai Drive, brown mudrock and cemented black sand were encountered from 18 to 25 ft, the depth drilled in Boring No. 13.

Water was encountered in the borings at about 5 to 8-ft depths during the field exploration. Because the site is along the banks of Kuapa Pond, water level will vary with the tide.

For more detailed descriptions of soils encountered in the drill holes, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

The preliminary grading plan generally indicates fills of less than 5 ft except at the approaches to the bridge over Kuapa Pond where the road profile rises to about 20 ft above the pond level.

A sewer line is tentatively planned along the roadway alignment with the invert level at about elevations -5 to -10 ft. At the bridge and the approach areas, the line will be routed around the south side of the bridge to avoid the high fills and bridge substructure.

Because of underlying soft layers, settlements may occur with the placement of new fills. The construction of fills should be done as soon as practicable to allow as much time as possible for settlements to occur.

Underground utilities should be installed after the fills are constructed.

Pavements should be delayed as long as practicable to allow as much time for the ground to settle and adjust to the new surface loading conditions.

Settlement observations should be made during and after the construction of fills, particularly at the bridge approaches to be used as a guide for scheduling the paving and surface construction work.

Unforeseen or undetected conditions such as soft spots in localized areas will have to be adjusted and corrected in the field as they are detected.

Fills

All grading should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended.

Guide lines regarding site grading are as follows:

1. All rubbish and unsuitable material should be disposed. Stockpiled soils should be removed. All loose surface soils should be stripped off or scarified and recompacted before placing of fills.

2. Localized soft pockets should be excavated and backfilled with compacted select material.

3. All hardened surfaces such as construction roads should be scarified and recompacted to match the density of the adjacent stiff ground.

4. In general, on-site coral material may be used for the construction of embankments. If fill material is imported to the site, it should be select non-expansive material generally less than 3-in. maximum size and the plasticity index less than 15.

5. To minimize differential settlements of fills behind bridge abutments, it is recommended that well-graded, granular material be used. The material should generally be less than 3-in. maximum size with less than 15% passing No. 200 sieve.

6. All fills should be constructed in approximately level layers starting at the lower end and working upward. All fills should be laid in 6-in. compacted layers. The fills below 2 ft from subgrade level should be compacted to a relative density of at least 90% of AASHO T-180-57 density. The fills within the top 2 ft of subgrade should be compacted to at least 95%.

7. To minimize the thickness of the subbase course, the top 2 ft of fills should be constructed with select materials generally with expansions of

less than 1% (by CBR method), CBR values of 25% or greater, or with plasticity indices of less than 10.

8. The subgrade should be graded to prevent ponding of water.

Slopes

Cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used above the water table.

Slope ratios of 4 horizontal to 1 vertical or flatter should be considered for slopes below the pond water level.

Slope adjustments or other precautions may be necessary if seepage zones or soft spots are encountered in localized areas.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Roadway Pavement Section

In general, an estimate of the pavement thickness for the proposed roadway is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course.

3. Subbase course - 6-in. subbase course over 6 in. of compacted existing or fill soils.

Provisions should be made in the contract documents to allow for local adjustments of subbase thickness in the field. In general, the subbase layer may be eliminated where coral or select material with CBR values greater than 25 is in the upper 2 ft of subgrade. Where pockets of clay (adobe) soils are exposed at subgrade, an 18-in. subbase layer should be used.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, subdrains should be placed to drain water from subgrade levels. Where catch basins are placed in low areas, weep holes should be placed at the subgrade levels through the walls of the catch basins which are placed in these low areas.

12-in. Sewer Line

From the preliminary plans, a proposed 12-in. sewer is planned along the roadway. The line would generally rest on the loose or soft soils below the surface crust. The preliminary invert elevations (-5 to -10 ft) indicate that the entire sewer line will be below ground water level.

Because of the stratified deposits of loose lagoonal deposits, soft pockets may occur below the pipe. Depending on the thickness of compressible materials underlying the pipe and the construction methods used by the contractor, settlements of several inches or more may occur.

About a 2-ft thick crushed rock cradling should be used for the sewer pipe bedding. Where the material at invert level is soft and clayey, the crushed rock cradling thickness should be increased to about 3 to 4 ft or extended down to a firm layer. At the end of each increment of excavation, the pipe cradling should be sealed to minimize the flow of water from areas where the pipe has already been placed.

Locally, crusher run rock graded from 3/4-in. to dust sizes with less than 10% passing the No. 200 sieve or similar material may be considered for the pipe cradling.

Where the material below the bottom of the trench is loose or is of soft to medium consistencies, the excavation difficulties will increase with depth, particularly where the depth of excavation exceeds 15 ft.

Excavation should be limited to small increments and backfilled as soon as practicable.

To minimize the settlement of the sewer line, the design may include that the sheets or soldier beams used by the contractor

for trench bracing be left in place after the pipe is installed. The sheets or soldier piles above the top of the pipe may be cut off and removed.

As much as practicable, heavy equipment and stockpiles should be kept away from the tops of open trenches. The ground near the top of excavation should be continually observed for cracks or dips that may serve as a warning device about where local sloughing might occur. Adjustments in work methods should be made if soft spots are encountered in localized areas.

Dewatering

In general, the contractor should be allowed to select his own dewatering system subject to the approval by the engineer. A system which may lead to the removal of fines should be avoided.

A dewatering system that would draw water downward and away from the trench excavation would be ideal. If dewatering is done so that the water level is lowered well below the bottom of the trench, the thickness of the pipe bedding may be reduced depending on the material at subgrade level.

Because of the stratified deposits of clays, silts and sands, it is possible that the bottom of the trench may blow or

liquify in localized pockets. Dewatering and pressure relieving pipes at the bottom of the trench may be helpful if they can be made operable.

If the contractor is unable to stabilize the bottom of the trench or dewatering is not feasible, the contractor should be allowed to place the pipe under wet conditions.

Future Construction

Any future construction work involving excavating, dewatering or filling near the site may cause additional settlements. Excavations or fills of several feet should be avoided.

BORING LOGS

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limits or sieve analysis test results.

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII

T.M.K.: 3-9-08:1

HAMMER:

Weight 140#

Drop 30"

SAMPLER: 2"ϕ - 2" STANDARD SPLIT SPOON

BORING NO. 1 Sheet No. ____ of ____

Driller WALTER LUM ASSOC. Date MAY 14, 1970

Field Party KAKU, SUZUKI

Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"

Elev. 4'± * Datum —

Drill Bit T.C. DRAG

Water Level	5.0'				
Time	-				
Date	5-14-70				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 4'± *↓									
(CH)	MEDIUM, BROWN CLAY W/GRAVEL & ROOTS		2"ϕ	1-A	-	33	-	-	-	
(CH)	SOFT, GRAY & BROWN, CLAY W/TRACES OF ROOTS	5	2"ϕ WATER 5-14-70 ▽	1-B	-	72	-	-	-	2 BLOWS PER FT.
(GC)	LOOSE, GRAY CLAYEY CORAL W/SAND		2"ϕ	1-C	-	35	-	-	-	2 BLOWS PER FT.
		10	2"ϕ	1-D	-	42	-	-	—	2 BLOWS PER FT.
	END OF BORING @ 11.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII

T.M.K. : 3-9-08:1

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2"ϕ - 2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. ____ of ____

Driller WALTER LUM ASSOC Date APRIL 13, 1970

Field Party SUZUKI, MAKAULA, HASHIDA

Type of Boring AUGER (B-40-L) Diam. 4"

Elev. 5'± * Datum —

Drill Bit T.C. DRAG

Water Level	6.0'			
Time	3:30 PM			
Date	4-13-70			

Unified Soil Classification	DESCRIPTION ELEV. = 5'± *	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
(CH)	BROWN, CLAY W/SAND & PUKA PUKA ROCK	0	2"ϕ	2-A	–	34	–	–	–	10/.3' HAMMER BOUNCES
	DENSE, BROWN, SAND & CEMENTED SAND		2"ϕ	2-B	27	21 13 35	47	–	–	25/.5' 15/.5'
ML-CL	STIFF, BROWN, SILTY CLAY	5	WATER 4-13-70							
CH	MEDIUM, BROWN, CLAY W/TRACES OF SAND		2"ϕ	2-C	26	28 53	70	–	–	
(SP-SC)	MEDIUM DENSITY, GRAY, SAND W/CORAL & TRACES OF CLAY	10	2"ϕ	2-D	–	42	–	–	–	
		15	2"ϕ	2-E	–	48	–	–	–	
(SC)	LOOSE, GRAY, CLAYEY SAND W/FINGER CORAL	20	2"ϕ	2-F	–	40	–	–	–	
(CL)	VERY SOFT, GRAY, CLAY W/SAND & CORAL	25	2"ϕ	2-G	–	41	–	–	–	2 BLOWS/1.5'
	END OF BORING @ 26.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT: PHASE II

LOCATION: HAWAII KAI, OAHU, HAWAII

T.M.K.: 3-9-08: 1

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"ϕ - 2" STANDARD SPLIT SPOON

BORING NO. 3 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC. Date: MAY 14, 1970

Field Party: KAKU, SUZUKI

Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"

Elev.: 5'± * Datum: —

Drill Bit: T.C. DRAG

Water Level	5.5'			
Time	11:30 AM			
Date	5-14-70			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 5'± *									
(CH)	MEDIUM; GRAY, CLAY W/ROOTS		2"ϕ	3-A	–	29	–	–	–	50/.3'
	COBBLE OR BOULDER									
(SM)	MEDIUM DENSITY, BROWN, SILTY SAND W/CORAL		2"ϕ	3-B	–	13	–	–	–	
		5	WATER 5-14-70							
(GP-GM)	LOOSE, CORAL W/GRAY SILTY SAND		2"ϕ	3-C	–	33	–	–	–	
		10								
(SC)	VERY LOOSE, GRAY CLAYEY SAND W/CORAL & SHELLS		2"ϕ	3-D	–	45	–	–	–	2 BLOWS PER FT.
	END OF BORING @ 11.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII

T.M.K. : 3-9-08: 1

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2"ss - 2" STANDARD SPLIT SPOON

BORING NO. 4 Sheet No. ____ of ____

Driller WALTER LUM ASSOC. Date APRIL 13, 1970

Field Party SUZUKI, MAKAULA, HASHIDA

Type of Boring AUGER (B-40-L) Diam. 4"

Elev. 8'± * Datum ____

Drill Bit T.C. DRAG

Water Level	7.4'				
Time	2:20 PM				
Date	4-13-70				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 8'± *	0								
(SP-SM)	DENSE, WHITE & GRAY, SAND W/CORAL		2"ss	4-A	-	11	-	-	-	
			2"ss	4-B	-	12	-	-	-	
		5	2"ss WATER 4-13-70	4-C	-	30 32	-	-	-	
(SM)	MEDIUM DENSITY TO LOOSE, GRAY, SILTY SAND W/CORAL	10	2"ss	4-D	-	36	-	-	-	
CL	VERY SOFT, LIGHT GRAY CLAY W/SAND & CORAL	15	2"ss	4-E	18	61	35	-	-	ONE BLOW/1.5'
SC	LOOSE, LIGHT GRAY, CLAYEY SAND W/CORAL	20	2"ss	4-F	-	38	-	-	-	
(CL)	VERY SOFT, LIGHT GRAY, CLAY W/SAND & CORAL	25	2"ss	4-G	-	42	-	-	-	ONE BLOW/1.5'
	END OF BORING @ 26.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT: PHASE II

LOCATION: HAWAII KAI, OAHU, HAWAII

T.M.K.: 3-9-08: 1

HAMMER:

Weight: 140#

Drop: 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 5 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC. Date: APRIL 13, 1970

Field Party: SUZUKI, MAKAULA, HASHIDA

Type of Boring: AUGER (B-40-L) Diam.: 4"

Elev.: 8'± * Datum: —

Drill Bit: T.C. DRAG

Water Level: 8.2'

Time: 12:15 PM

Date: 4-13-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 8'± *	0								
(SC)	DENSE, WHITE & GRAY, CLAYEY SAND W/CORAL		2"SS	5-A	-	16	-	-	-	
(SM)	DENSE, BROWN, SILTY SAND W/CORAL	5	2"SS	5-B	-	11	-	-	-	
(CH)	STIFF, DARK BROWN, CLAY W/ TRACES OF SAND & CORAL		2"SS WATER 4-13-70	5-C	-	30	-	-	-	
(SC)	LOOSE, LIGHT GRAY, CLAYEY SAND W/CORAL	10	2"SS	5-D	-	43	-	-	-	
	END OF BORING @ 11.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT: PHASE II
LOCATION: HAWAII KAI, OAHU, HAWAII
T.M.K.: 3-9-08:1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"ϕ - 2" STANDARD SPLIT SPOON

BORING NO. 6 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: MAY 13, 1970
Field Party: KAKU, SUZUKI
Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"
Elev.: 8'± * Datum: —
Drill Bit: T.C. DRAG
Water Level: 5.5'
Time:
Date: 5-13-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 8'± *									
	STOCKPILE OF GRAY DREDGED MATERIAL ~4½'	0								
(SP-SM)	MEDIUM DENSITY, GRAY, SILTY SAND W/CORAL		2"ϕ	6-A	-	11	-	-	-	
			2"ϕ	6-B	-	12	-	-	-	
		5	WATER 5-13-70							
CL	SOFT, LIGHT GRAY, CLAY		2"ϕ	6-C	19	49 54	40	-	-	ONE BLOW PER FT.
(CH)	SOFT, GRAY CLAY W/SAND	10								
GW-GM	LOOSE, CORAL W/GRAY SILTY SAND		2"ϕ	6-D	-	35	-	-	-	
		15								
			2"ϕ	6-E	-	38	-	-	-	
		20								
CL	SOFT, LIGHT GRAY CLAY W/CORAL		2"ϕ	6-F	16	48	46	-	-	2 BLOWS/1.5'
		25								
			2"ϕ	6-G	-	50	-	-	-	2 BLOWS PER FT.
	END OF BORING @ 26.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT PHASE II

LOCATION HAWAII KAI , OAHU , HAWAII

T.M.K. : 3-9-08:1

HAMMER:

Weight 140*

Drop 30"

SAMPLER: 2"ϕ - 2" STANDARD SPLIT SPOON

BORING NO. 7 Sheet No. _____ of _____

Driller WALTER LUM ASSOC. Date MAY 13, 1970

Field Party KAKU, SUZUKI

Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"

Elev. 8'± * Datum —

Drill Bit T.C DRAG

Water Level	5.7'			
Time	10:45 AM			
Date	5-13-70			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 8'± *									
	STOCKPILE OF GRAY DREDGED MATERIAL ±2'	0								
SP-SM	MEDIUM DENSITY, WHITE, SILTY SAND W/CORAL		2"ϕ	7-A	-	10	-	-	-	
			2"ϕ	7-B	-	11	-	-	-	
			WATER 5-13-70							
			2"ϕ	7-C	-	26 44	-	-	-	ONE BLOW PER FT.
(SM)	LOOSE, WHITE & GRAY SILTY SAND									
(GM)	LOOSE, GRAY SILTY CORAL W/ SAND		2"ϕ	7-D	-	35	-	-	-	
	END OF BORING @ 11.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT PHASE II.

LOCATION HAWAII KAI, OAHU, HAWAII

TMK: 3-9-08:1

HAMMER:

Weight 140#

Drop 30"

SAMPLER: 2" SS- 2" STANDARD SPLIT SPOON

BORING NO. 8 Sheet No. ____ of ____

Driller WALTER LUM ASSOC Date APRIL 7, 1970

Field Party SUZUKI, CHAPMAN, HASHIDA

Type of Boring AUGER (B-40-L) Diam. 4"

Elev. 8'± * Datum ____

Drill Bit T.C. DRAG

Water Level	6.2'			
Time	4:00PM			
Date	4-7-70			

Unified Soil Classification	DESCRIPTION ELEV. = 8'± *	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
(SP-SM)	DENSE, GRAY, SILTY SAND W/CORAL		2"SS	8-A	-	11	-	-	-	43
			2"SS	8-B	-	16	-	-	-	
		5	WATER 4-7-70							
(SP-SM)	LOOSE, GRAY, SILTY SAND W/ TRACES OF CORAL		2"SS	8-C	-	37	-	-	-	
		10	2"SS	8-D	-	48	-	-	-	
(SC)	LOOSE, GRAY, CLAYEY SAND W/CORAL	15	2"SS	8-E	-	36	-	-	-	2 BLOWS/1.4'
		20	2"SS	8-F	-	58	-	-	-	ONE BLOW PER FT.
(SC)	VERY LOOSE, GRAY, CLAYEY SAND W/CORAL	25	2"SS	8-G	-	43	-	-	-	2 BLOWS PER FT.
	END OF BORING @ 26.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII
TMK: 3-9-08:1

HAMMER:
Weight 140 #
Drop 30"

SAMPLER: 2" SS - 2" STANDARD SPLIT SPOON

BORING NO. 9 Sheet No. ____ of ____

Driller WALTER LUM ASSOC. Date APRIL 7, 1970

Field Party SUZUKI, CHAPMAN, HASHIDA

Type of Boring AUGER (B-40-L) Diam. 4"

Elev. 8'± * Datum –

Drill Bit T.C. DRAG

Water Level				
Time				
Date				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 8'± *									
(SP-SM)	MEDIUM DENSITY, TAN, SAND W/CORAL		2"SS	9-A	-	11	-	-	-	
			2"SS	9-B	-	32	-	-	-	
		5								
(CH)	VERY SOFT, LIGHT GRAY, CLAY		2"SS	9-C	-	61 115	-	-	-	2 BLOWS/0.5'
(CH-OH)	VERY SOFT, BROWN, ORGANIC CLAY (PEATY)									
		10								
(SM)	LOOSE TO MED. DENSITY, LIGHT GRAY, SILTY SAND W/CORAL		2"SS	9-D	-	34	-	-	-	2.5' 7.5'
	END OF BORING @ 11.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII
TMK: 3-9-08:1

HAMMER:
Weight 140 #
Drop 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 10 Sheet No. ____ of ____

Driller WALTER LUM ASSOC Date MARCH 26, 1970

Field Party SUZUKI, HASHIDA

Type of Boring AUGER(B-40-L) Diam. 4"

Elev. 9'± * Datum —

Drill Bit T.C. DRAG

Water Level				
Time				
Date				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 9'± *	0								
(GP-GM)	MEDIUM DENSITY, GRAY & WHITE, SILTY CORAL W/SAND		2"SS	10-A	-	8	-	-	-	
			2"SS	10-B	-	9	-	-	-	12/.5' 6/.5'
		5								
(SM)	LOOSE, LIGHT GRAY, SILTY SAND		2"SS	10-C	-	38	-	-	-	8/.8'
	SOFT, DARK GRAY, CLAY & PEAT									
		10								
(SC)	LOOSE, LIGHT GRAY, CLAYEY SAND W/CORAL		2"SS	10-D	-	32	-	-	-	
	END OF BORING @ 11.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA

PROJECT: PHASE II

LOCATION: HAWAII KAI, OAHU, HAWAII

TMK: 3-9-08:1

HAMMER:

Weight: 140 #

Drop: 30"

SAMPLER: 2" SS - 2" STANDARD SPLIT SPOON

BORING NO. 11 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC. Date: MARCH 25, 1970

Field Party: SUZUKI, HASHIDA

Type of Boring: AUGER (B-40-L) Diam.: 4"

Elev.: 9' ± * Datum: —

Drill Bit: T.C. DRAG

Water Level	5.0'				
Time	3:30 PM				
Date	3-25-70				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 9' ± *	0								
(SP-SM)	DENSE, GRAY & WHITE, SILTY SAND W/CORAL		2" SS	11-A	-	10	-	-	-	46
		5	2" SS 3-25-70 ▽	11-B	-	23	-	-	-	
(SC)	MEDIUM DENSITY, LIGHT GRAY, SAND W/GRAY CLAY POCKETS		2" SS	11-C	-	38 63	-	-	-	
		10								
(SC)	LOOSE, LIGHT GRAY, CLAYEY SAND W/CORAL		2" SS	11-D	-	42	-	-	-	
		15	2" SS	11-E	NO	RECOVERY				
		20								
CL	SOFT, LIGHT GRAY, CLAY W/TRACES OF SAND		2" SS	11-F	19	72	40	-	-	TWO BLOWS/1.5'
		25	2" SS	11-G	-	59	-	-	-	
	END OF BORING @ 26.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT: PHASE II

LOCATION: HAWAII KAI, OAHU, HAWAII

T.M.K.: 3-9-08:1

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"ss - 2" STANDARD SPLIT SPOON

BORING NO. 12 Sheet No. _____ of _____

Driller: WALTER LUM ASSOC. Date: MAY 12, 1970

Field Party: KAKU, SUZUKI

Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"

Elev.: 8'± * Datum: —

Drill Bit: T.C. DRAG

Water Level: 7.5'
Time: 3:20 PM
Date: 5-12-70

Unified Soil Classification	DESCRIPTION ELEV. = 8'± *	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
GC	MEDIUM DENSITY, GRAY-BROWN, CLAYEY CORAL W/SAND & SHELLS		2"ss	12-A	-	26	-	-	-	
			2"ss	12-B	-	28 36	-	-	-	
(CH)	STIFF, BROWN CLAY W/CORAL	5								
CH	MEDIUM, BROWN CLAY W/TRACES OF DECOMPOSED ROCK		2"ss WATER 5-12-70	12-C	28	40	56	-	-	
		10								
(GC)	LOOSE, GRAY, CLAYEY CORAL W/SAND		2"ss	12-D	-	40	-	-	-	
	END OF BORING @ 11.5'									

* Elevation Estimated from Grading Plan

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT: PHASE II

LOCATION: HAWAII KAI, OAHU, HAWAII
TMK: 3-9-08:1

HAMMER:
Weight: 140 #
Drop: 30"

SAMPLER: 2"SS-2" STANDARD SPLIT SPOON

BORING NO. 13 Sheet No. ____ of ____
Driller WALTER LUM ASSOC. Date MARCH 25, 1970
Field Party SUZUKI, HASHIDA
Type of Boring AUGER (B-40-L) Diam. 4"
Elev. 8'± * Datum –
Drill Bit T.C. DRAG

Water Level	7.2'			
Time	11:25 AM			
Date	3-26-70			

Unified Soil Classification	DESCRIPTION (ELEV. = 8'± *)	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
(CL)	STIFF, GRAY, CLAY W/SAND & CORAL		2"SS	13-A	–	38	–	–	–	
CL	MEDIUM, GRAY BROWN, CLAY W/SAND	5	2"SS	13-B	10	38	45	–	–	
(SM)	DENSE, BROWN, SILTY SAND W/ PUKA PUKA ROCK		2"SS WATER 3-25-70	13-C	–	11	–	–	–	
	COBBLE	10								
(SM)	MEDIUM DENSITY, BROWN, SILTY SAND W/ PUKA PUKA ROCK		2"SS	13-D	–	23	–	–	–	
(SC)	VERY LOOSE, BROWN-BLACK, CLAYEY SAND W/GRAVEL	15	2"SS	13-E	–	23 87	–	–	–	2 BLOWS PER FT.
(CH)	VERY SOFT, GRAY CLAY W/ SAND									
	MOTTLED BROWN, MUDROCK	20	2"SS	13-F	–	48	–	–	–	70/.7'
	CEMENTED, BLACK, SAND									
	CEMENTED, LT. GRAY, SAND	25	2"SS	13-G	–	19 36	–	–	–	66/.7'
	END OF BORING @ 25.7'									

* Elevation Estimated from Grading Plan

TRANS-MARINA ROAD - PHASE II

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	2	2	2	
SAMPLE NO.		B (BOT.)	C (TOP)	
DEPTH BELOW SURFACE	SURFACE	3'-4.5'	6'-7.5'	
DESCRIPTION	BROWN SANDY CLAY	BROWN SILTY CLAY	BROWN CLAY W/TRACES OF SAND	
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"	100			
1/2"	100			
#4	98.6			
#10	96.0			
#20	90.6			
#40	82.0			
#100	71.0			
#200	66.0			
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit	58	47	70	
Plastic Limit	30	27	26	
Plasticity Index	28	20	44	
Dilatancy	SLOW	SLOW	NONE	
Toughness	MEDIUM	MEDIUM	HIGH	
Dry Strength	MED.-HIGH	MEDIUM	HIGH	
UNIFIED SOIL CLASSIFICATION	MH-CH	ML-CL	CH	
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	24.1			
Molding Dry Density, P.C.F.	98.4			
Swell upon saturation, %	7.5			
CBR at 0.1" Penetration	2.5			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-5-70 By BT

TRANS-MARINA ROAD - PHASE II

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	4	4		5
SAMPLE NO.	E	F		
DEPTH BELOW SURFACE	15'-16.5'	20'-21.5		SURFACE
DESCRIPTION	LIGHT GRAY CLAY W/SAND & CORAL	LIGHT GRAY CLAYEY SAND W/CORAL		GRAY CLAYEY SAND W/CORAL
GRAIN-SIZE ANALYSIS (% Passing)				
Sieve				
1"		100		86.0
1/2"		93.1		72.8
#4		77.8		62.6
#10		68.3		55.3
#20		59.6		46.3
#40		52.6		36.5
#100		36.2		23.0
#200		29.8		19.3
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL			
Liquid Limit	35			
Plastic Limit	18			
Plasticity Index	17			
Dilatancy	SLOW			
Toughness	MEDIUM			
Dry Strength	MEDIUM			
UNIFIED SOIL CLASSIFICATION	CL	SC		SC
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				14.4
Molding Dry Density, P.C.F.				111.2
Swell upon saturation, %				0.1
CBR at 0.1" Penetration				40.0
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-5-70 By BT

TRANS-MARINA ROAD - PHASE II

TABLE I C - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	6	6	6	9
SAMPLE NO.	C (TOP)	E	F	
DEPTH BELOW SURFACE	6'-7.5'	15'-16.5'	20'-21.5'	SURFACE
DESCRIPTION	LIGHT GRAY CLAY	CORAL W/GRAY SILTY SAND	LIGHT GRAY CLAY W/CORAL	GRAY + WHITE SAND W/CORAL
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"		100		81.6
1/2"		80.0		67.6
#4		45.6		53.3
#10		35.8		46.6
#20		28.2		40.0
#40		22.8		32.0
#100		11.5		6.9
#200		8.4		3.5
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL		NATURAL	
Liquid Limit	49		46	
Plastic Limit	19		16	
Plasticity Index	30		30	
Dilatancy	QUICK		SLOW	
Toughness	MEDIUM		MEDIUM	
Dry Strength	MEDIUM		MEDIUM	
UNIFIED SOIL CLASSIFICATION	CL	GW-GM	CL	SP
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				14.8
Molding Dry Density, P.C.F.				96.6
Swell upon saturation, %				NIL
CBR at 0.1" Penetration				46.0
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-5-70 By BT

TRANS-MARINA ROAD - PHASE II

TABLE I.D - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	10	11	12	12
SAMPLE NO.		F		C
DEPTH BELOW SURFACE	SURFACE	20'-21.5'	SURFACE	6'-7.5'
DESCRIPTION	GRAY & WHITE SILTY SAND W/CORAL	LIGHT GRAY CLAY W/TRACES OF SAND	GRAY-BROWN CLAYEY CORAL W/SAND	BROWN CLAY W/TRACES OF DECOMP. ROCK
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"	91.8		90.9	
1/2"	76.2		73.6	
#4	59.5		66.0	
#10	49.3		61.8	
#20	40.5		57.6	
#40	31.6		53.2	
#100	14.3		43.7	
#200	11.3		40.8	
ATTERBERG LIMITS				
Air Dried or Natural		NATURAL		NATURAL
Liquid Limit		40		56
Plastic Limit		19		28
Plasticity Index		21		28
Dilatancy		SLOW		NONE
Toughness		MEDIUM		HIGH
Dry Strength		MEDIUM		HIGH
UNIFIED SOIL CLASSIFICATION	SP-SM	CL	GC	CH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	11.3		19.6	
Molding Dry Density, P.C.F.	110.0		105.3	
Swell upon saturation, %	NIL		4.3	
CBR at 0.1" Penetration	164.0		3.2	
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-5-70 By BT

TRANS-MARINA ROAD - PHASE II

TABLE I E - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	13	13		
SAMPLE NO.		8		
DEPTH BELOW SURFACE	SURFACE	3'-4.5'		
DESCRIPTION	BROWN SILTY SAND W/CORAL	GRAY-BROWN CLAY W/SAND		
GRAIN-SIZE ANALYSIS (% Passing)				
Sieve				
1"	90.5			
1/2"	85.1			
#4	75.3			
#10	69.9			
#20	64.6			
#40	58.9			
#100	32.6			
#200	26.6			
ATTERBERG LIMITS				
Air Dried or Natural		NATURAL		
Liquid Limit		45		
Plastic Limit	NON-PLASTIC	19		
Plasticity Index		26		
Dilatancy		SLOW		
Toughness		MEDIUM		
Dry Strength		MED-HIGH		
UNIFIED SOIL CLASSIFICATION	SM	CL		
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	14.2			
Molding Dry Density, P.C.F.	115.3			
Swell upon saturation, %	NIL			
CBR at 0.1" Penetration	37.0			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

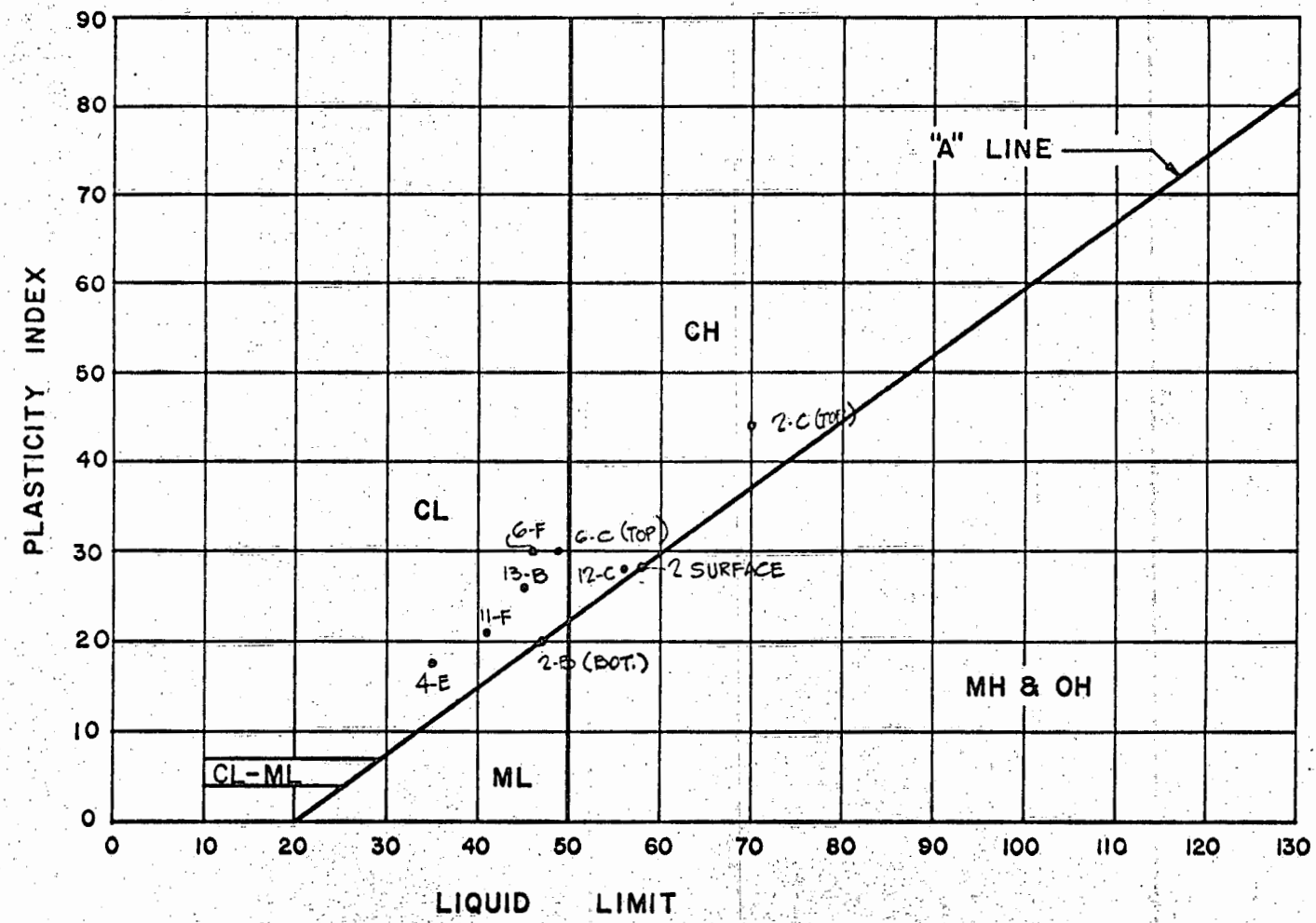
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-5-70 By BT

PLASTICITY CHART

PROJECT: TRANS-MARINA ROAD- PHASE II

LOCATION: HAWAII-KAI, OAHU, HAWAII



DATE 8-5-70 BY BT

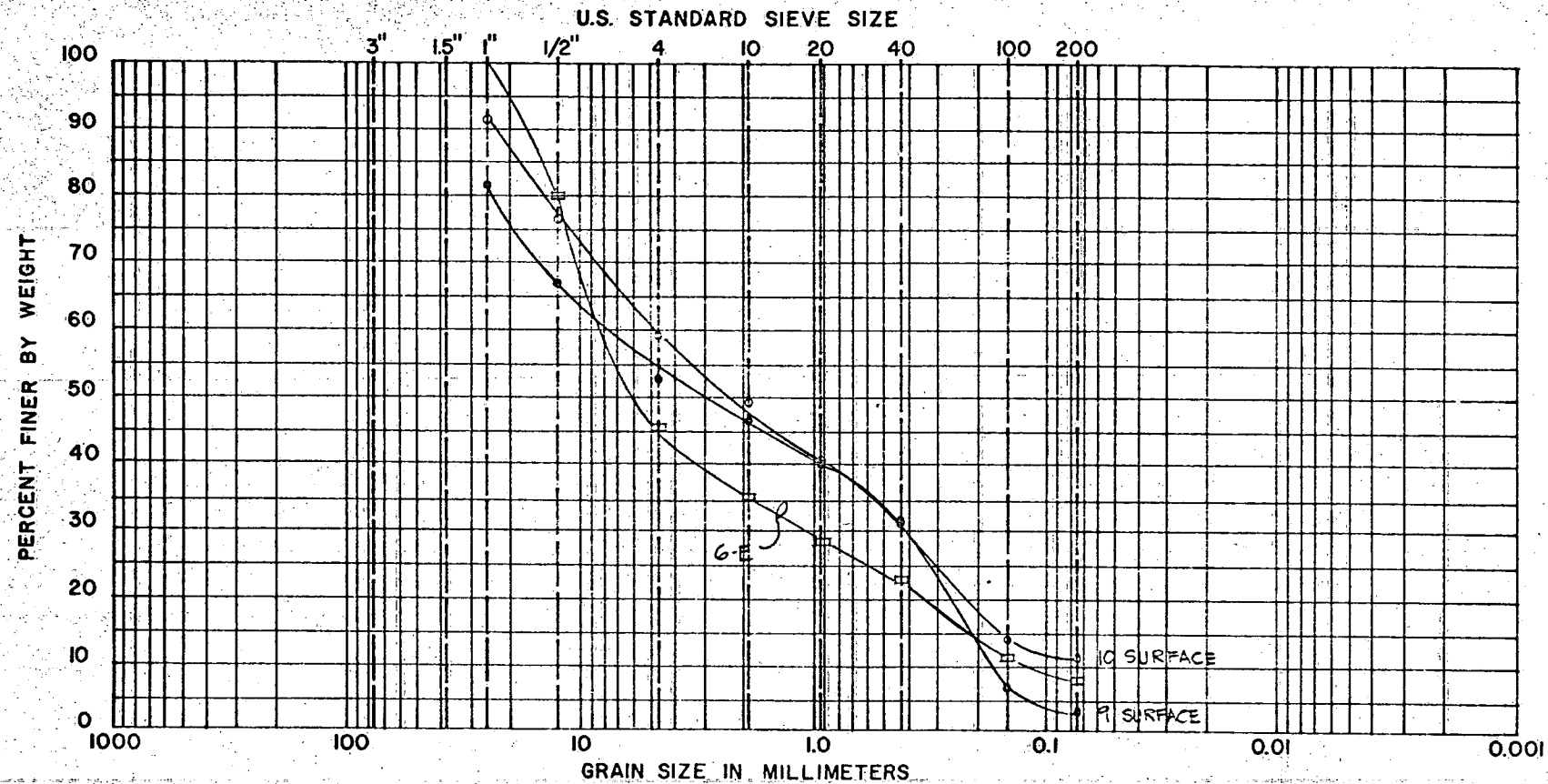
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

13-570

GRAIN-SIZE ANALYSIS CURVE

PROJECT: TRANSMARINA ROAD, PHASE II

LOCATION: HAWAII-KAI, OAHU, HAWAII



COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

DATE 7-28-70 BY B.T

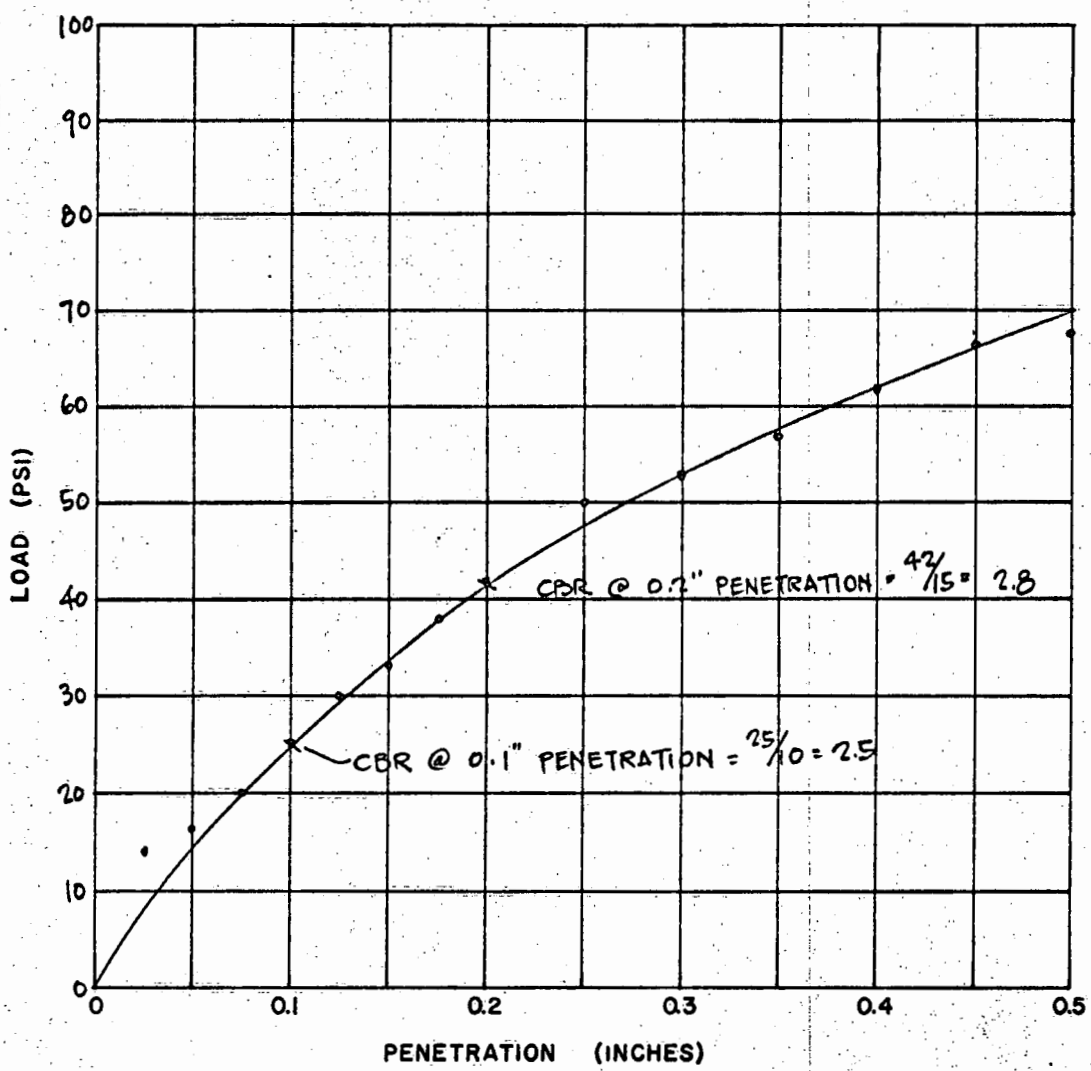
CBR TEST

PROJECT: TRANSMARINA ROAD - PHASE II

LOCATION: HAWAII-KAI, OAHU, HAWAII

SAMPLE NO: 2 SURFACE

SAMPLE DESCRIPTION: BROWN SANDY CLAY



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	50	17
0.050	55	18
0.075	60	20
0.100	75	25
0.125	90	30
0.150	100	33
0.175	115	38
0.200	125	42
0.250	150	50
0.300	160	53
0.350	170	57
0.400	185	62
0.450	200	67
0.500	205	68

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 24.1

MOLDING DRY DENSITY, P.C.F. 98.4

CBR @ 0.1" PENETRATION 2.5

DATE 4-25-70 BY A.F.

DATE 4-30-70 BY B.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

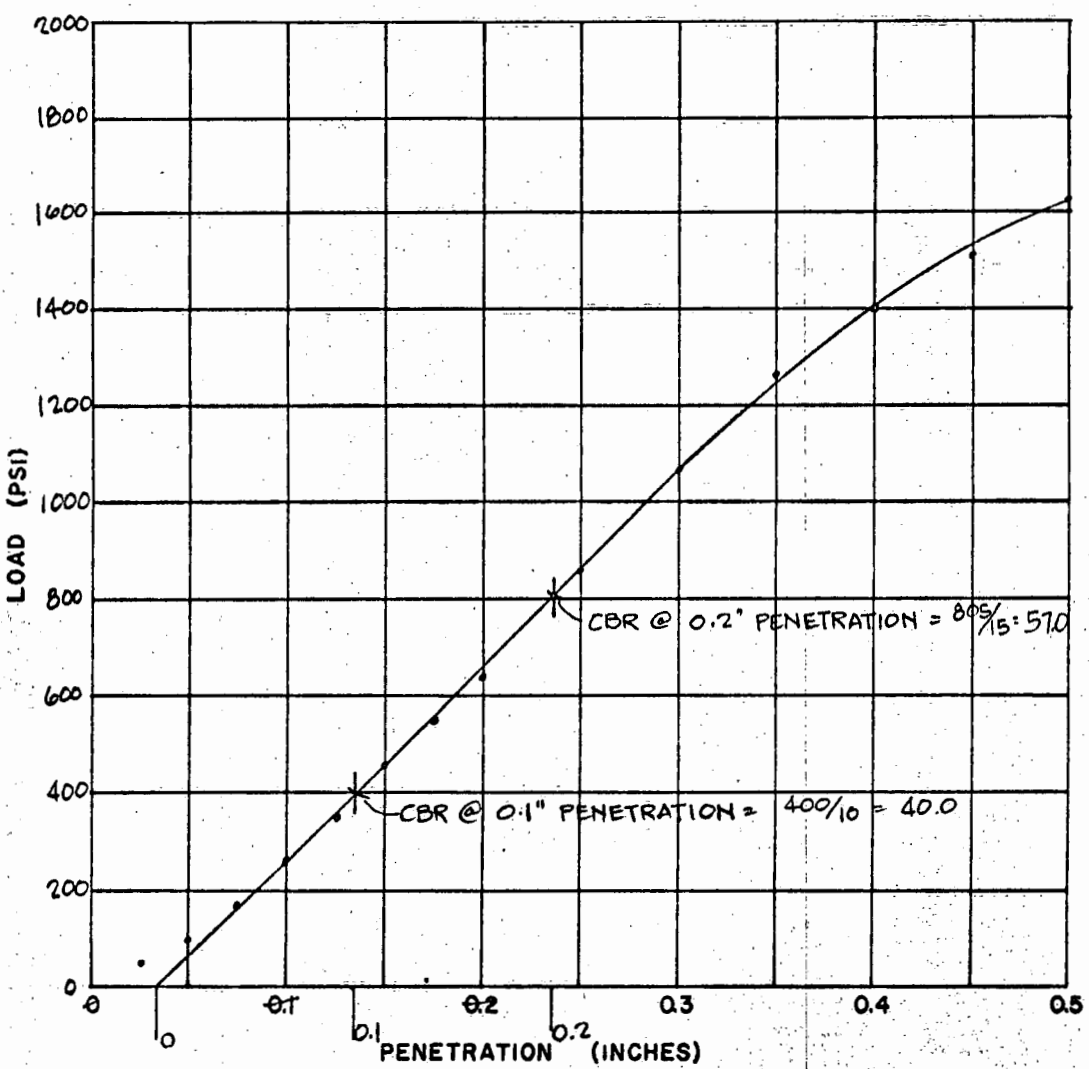
CBR TEST

PROJECT: TRANSMARINA ROAD - PHASE II

LOCATION: HAWAII-KAI, OAHU, HAWAII

SAMPLE NO: 5 SURFACE

SAMPLE DESCRIPTION: GRAY CLAYEY SAND W/CORAL



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	130	43
0.050	270	90
0.075	500	167
0.100	760	253
0.125	1060	353
0.150	1360	453
0.175	1650	550
0.200	1920	640
0.250	2570	857
0.300	3120	1040
0.350	3720	1273
0.400	4200	1400
0.450	4550	1517
0.500	4870	1623

AGGREGATE 3/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 14.4

MOLDING DRY DENSITY, P.C.F. 111.2

CBR @ 0.1" PENETRATION 40.0

DATE 4-25-70 BY A.F.

DATE 4-30-70 BY B.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

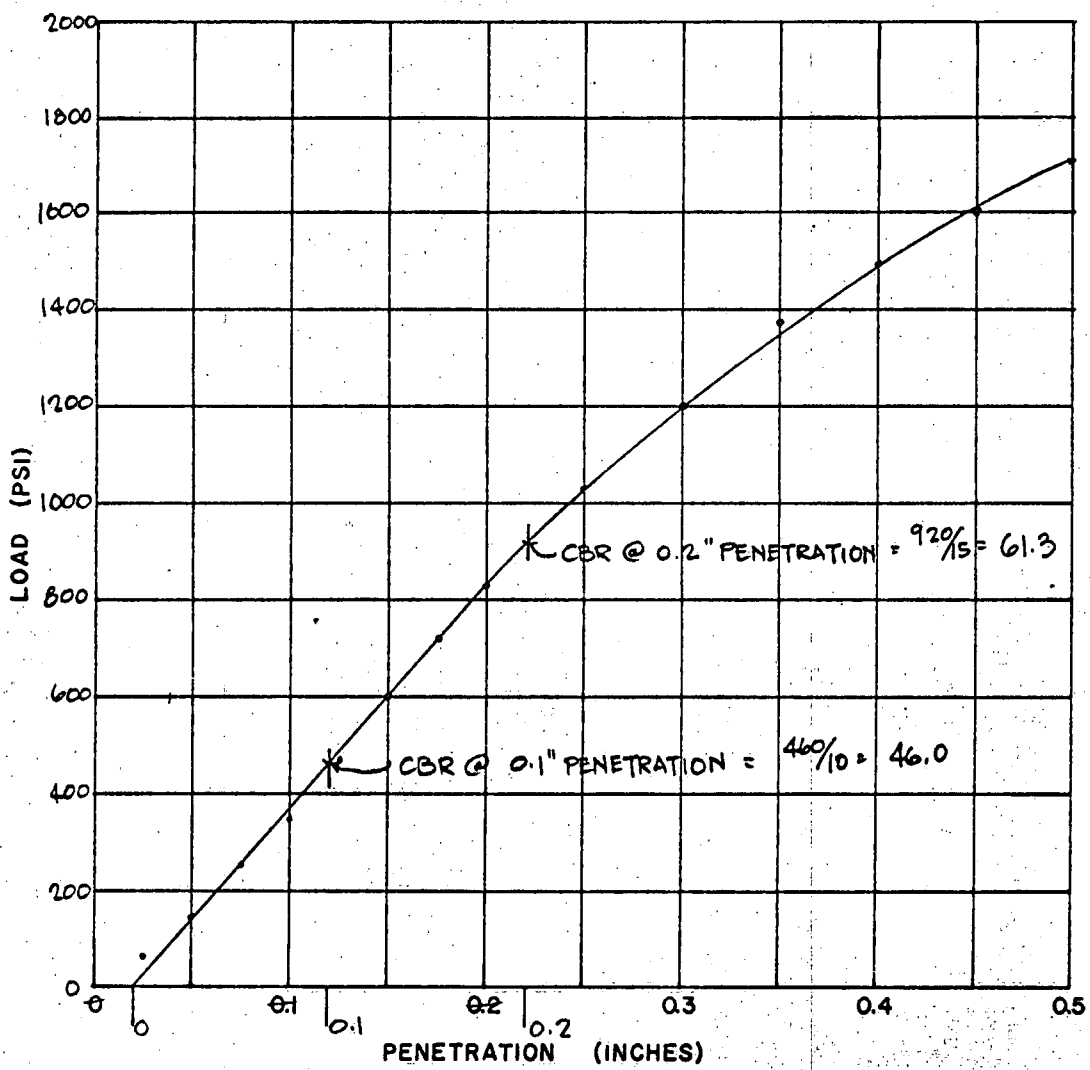
CBR TEST

PROJECT: TRANS-MARINA ROAD - PHASE II

LOCATION: HAWAII-KAI, OAHU, HAWAII

SAMPLE NO: 9 SURFACE

SAMPLE DESCRIPTION: GRAY & WHITE SAND W/CORAL



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	200	67
0.050	430	143
0.075	740	247
0.100	1040	347
0.125	1410	470
0.150	1800	600
0.175	2160	720
0.200	2500	833
0.250	3100	1033
0.300	3600	1200
0.350	4100	1367
0.400	4450	1483
0.450	4800	1600
0.500	5100	1700

AGGREGATE 3/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 14.8

MOLDING DRY DENSITY, P.C.F. 96.6

CBR @ 0.1" PENETRATION 46.0

DATE 5-16-70 BY R.M.

DATE 5-21-70 BY B.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

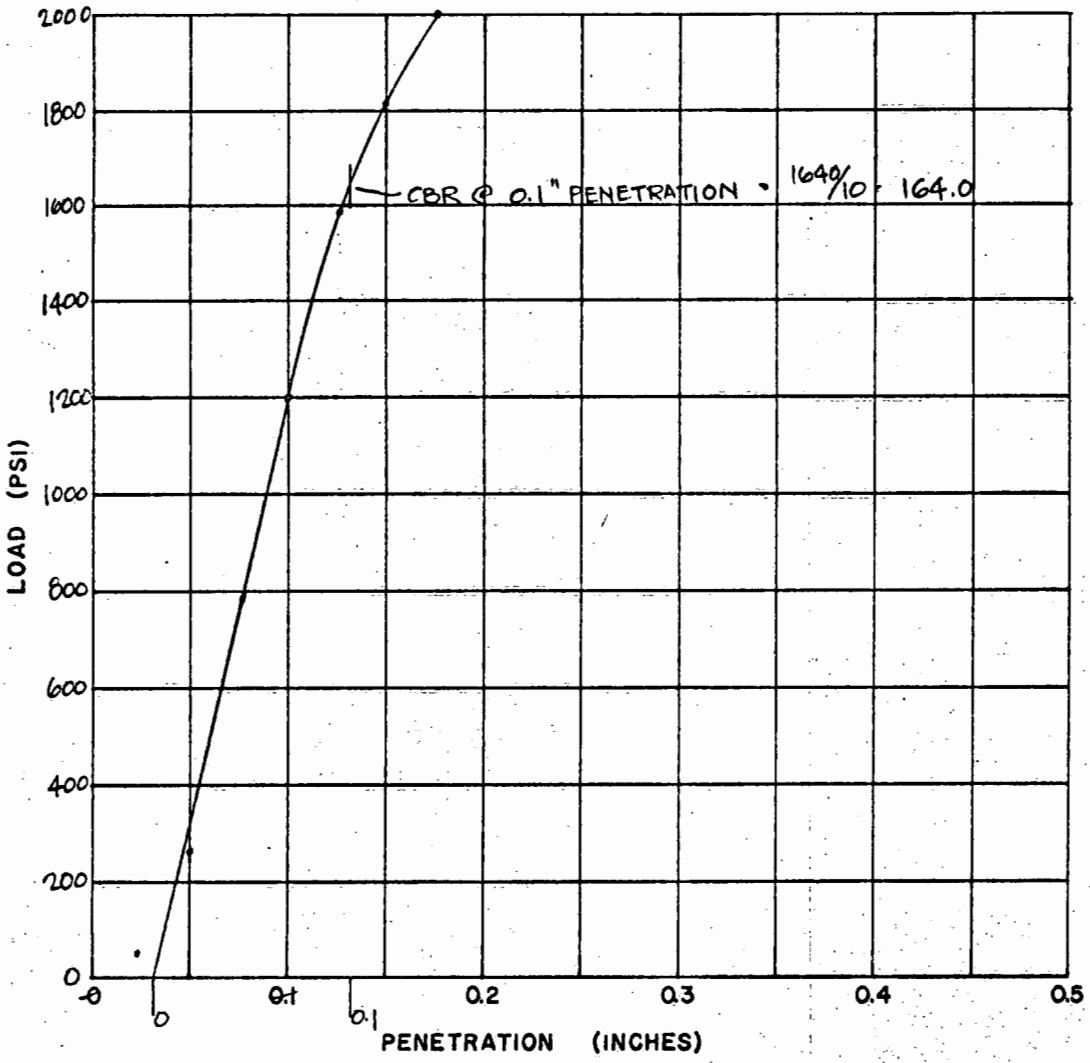
CBR TEST

PROJECT: TRANS-MARINA ROAD - PHASE II

LOCATION: HAWAII-KAI, OAHU, HAWAII

SAMPLE NO: 10 SURFACE

SAMPLE DESCRIPTION: GRAY-BROWN SILTY SAND W/CORAL



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	130	43
0.050	800	267
0.075	2350	783
0.100	3600	1200
0.125	4750	1583
0.150	5450	1817
0.175	6000	2000
0.200		
0.250		
0.300		
0.350		
0.400		
0.450		
0.500		

AGGREGATE 3/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 11.3

MOLDING DRY DENSITY, P.C.F. 110.0

CBR @ 0.1" PENETRATION 164.0

DATE 5-16-70 BY R.M.

DATE 5-21-70 BY B.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

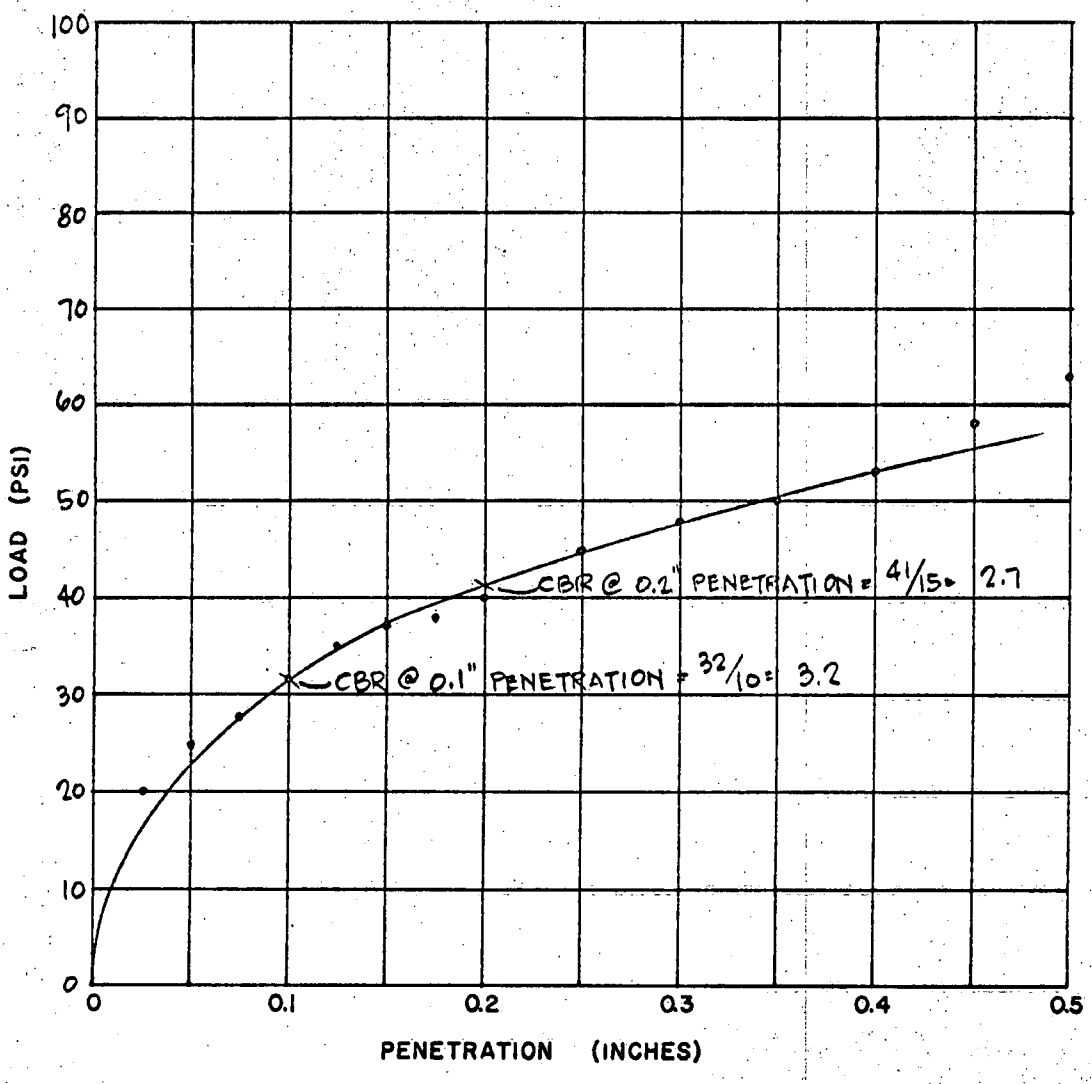
CBR TEST

PROJECT: TRANS-MARINA ROAD · PHASE II

LOCATION: HAWAII-KAI, OAHU, HAWAII

SAMPLE NO: 12 SURFACE

SAMPLE DESCRIPTION: GRAY-BROWN CLAYEY CORAL W/SAND



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	60	20
0.050	75	25
0.075	85	28
0.100	95	32
0.128	106	35
0.150	110	37
0.175	115	38
0.200	120	40
0.250	135	45
0.300	145	48
0.350	150	50
0.400	160	53
0.450	175	58
0.500	190	63

AGGREGATE 3/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 19.6

MOLDING DRY DENSITY, P.C.F. 105.3

CBR @ 0.1" PENETRATION 3.2

DATE 5-16-70 BY R.M.

DATE 5-21-70 BY B.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

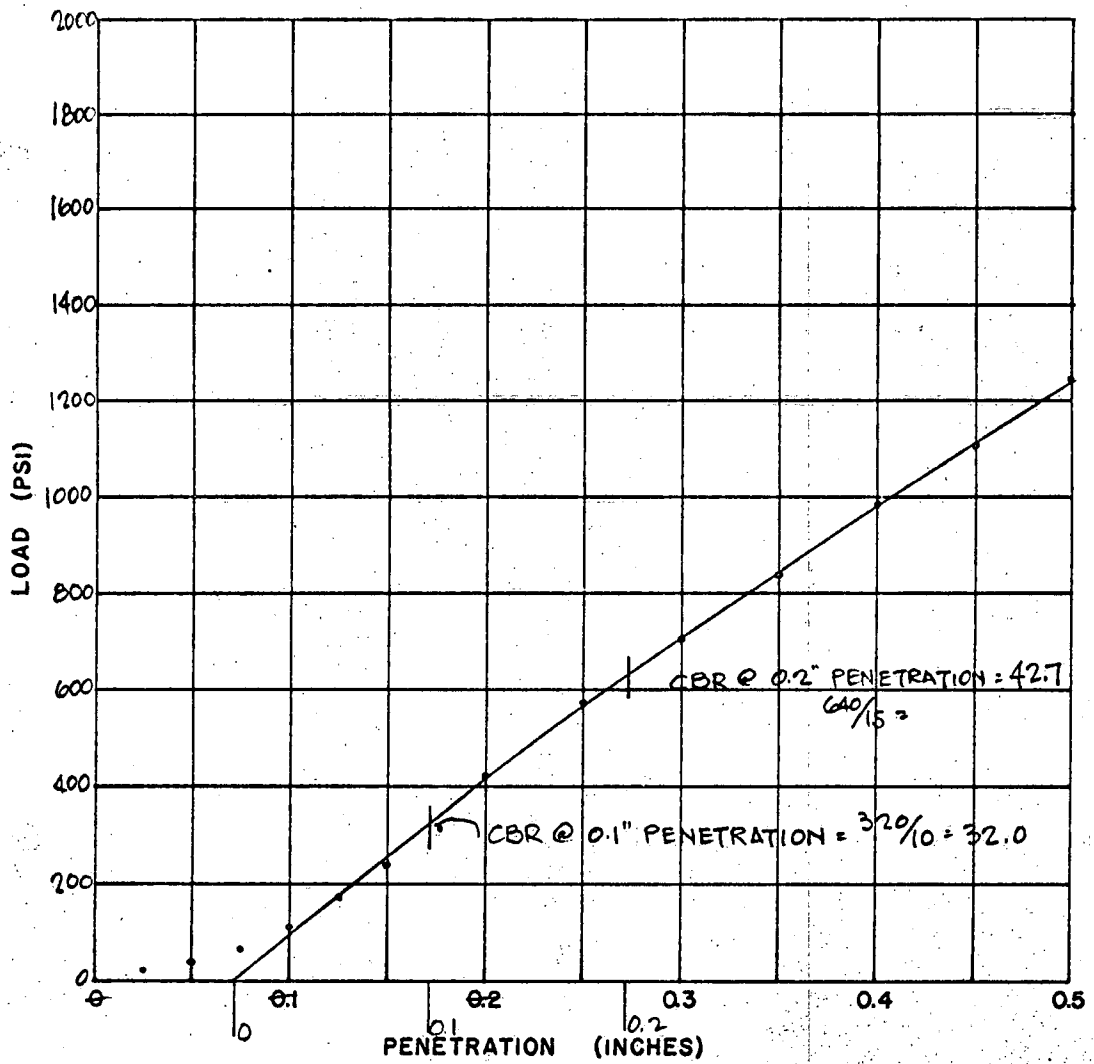
CBR TEST

PROJECT: TRANS-MARINA ROAD - PHASE II

LOCATION: HAWAII-KAI, OAHU, HAWAII

SAMPLE NO: 13 SURFACE

SAMPLE DESCRIPTION: BROWN SILTY SAND W/CORAL



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	70	23
0.050	120	40
0.075	200	67
0.100	340	113
0.125	530	177
0.150	720	240
0.175	950	317
0.200	1230	410
0.250	1700	567
0.300	2120	707
0.350	2520	840
0.400	2950	983
0.450	3350	1117
0.500	3740	1247

AGGREGATE 3/4" MINUS

HAMMER WEIGHT 10 LBS

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 14.2

MOLDING DRY DENSITY, P.C.F. 115.3

CBR @ 0.1" PENETRATION 32.0

DATE 5-16-70 BY R.M.

DATE 5-21-70 BY B.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

LOGS OF BORINGS

FROM

"TRANS-MARINA ROAD BRIDGE - PHASE II"

REPORT DATED JULY 21, 1970

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT BRIDGE - PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII

T.M.K.: 3-9-08: 1

HAMMER:

Weight 140 #

Drop 30"

SAMPLER: 2" DIA. BLUNT POINT

BORING NO. 4 Sheet No. ____ of ____

Driller WALTER LUM ASSOC. Date MAY 12, 1970

Field Party KAKU, SUZUKI

Type of Boring CONTINUOUS PENETRATION Diam. 2"

Elev. 6' ± * Datum ____

Drill Bit ____

Water Level	NOT READABLE				
Time	—				
Date	5-12-70				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 6' ± *									
		10								
		20								
		30								76
	END OF PENETRATION @ 34.5'									55
										43/.5

* Elevation Estimated from Topo Map

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT BRIDGE - PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII

TMK: 3-9-08 : 1

HAMMER:

Weight 140 #

Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 7 Sheet No. _____ of _____

Driller WALTER LUM ASSOC. Date APRIL 17, 1970

Field Party SUZUKI, GETO

Type of Boring ROTARY w/ MUD Diam. 'NX' CASING

Elev. -2' ± ** Datum M.S.L.

Drill Bit T.C. DRAG

Water Level	+ 1.0'				
Time	10:30AM				
Date	4-17-70				

Soil Classification	DESCRIPTION	Depth (Ft.) 4-17-70 Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = -2' ± **	0							
(GM)	LOOSE, GRAY SILTY SAND & CORAL	5	7-A	-	26	-	-	-	6/.5'
			7-B	-	29	-	-	-	
		10	7-C	-	41	-	-	-	1 BLOW/2.0'
GC	LOOSE, GRAY CLAYEY CORAL W/ SAND	15	7-D	-	46	-	-	-	2 BLOWS/FT.
	MUDROCK	20	7-E	-	43 62	-	-	-	1 BLOW/.5'
		25	7-F	-	51	-	-	-	
SM	MEDIUM DENSITY BLACK SILTY SAND	30	7-G	-	27	-	-	-	
	MUDROCK	35	7-H	-	47	-	-	-	40
CH	STIFF, BROWN CLAY	40	7-I	33	47 36	75	-	-	12/.5' 20/.2'
		45	7-J	-	30	-	-	-	72/.5'
		50	7-K	-	21	-	-	-	66
	CORAL	55							
	NOTE: FROM 65' ON, SLOW LOSS OF DRILLING MUD	60	7-L	-	38	-	-	-	60/.4'
		65							
		70	7-M	-	10	-	-	-	
(GM)	MEDIUM DENSITY, WHITE SILTY SAND & CORAL	75							
		80	7-N	-	13	-	-	-	
	END OF BORING @ 81.5'								

ROTARY w/ MUD DRILLING CHOPPING BIT

** Elevation Estimated from Tide Chart

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT BRIDGE - PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII

T.M.K. : 3-9-08:1

HAMMER:

Weight 140*

Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 10 Sheet No. _____ of _____

Driller WALTER LUM ASSOC. Date APRIL 28 & 30, 1970

Field Party CHAPMAN, MAKAULA, SUZUKI

Type of Boring ROTARY W/CASING Diam. 3"

Elev. -8' ± ** Datum M.S.L.

Drill Bit CHOPPING & T.C. DRAG BIT

Water Level +7.5'

Time 1:30 PM

Date 4-28-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	WATER (VARIES W/TIDE)		▽							
	ELEV. = -8' ±**	0								
(CH)	SOFT, GRAY, CLAY W/CORAL FRAGMENTS			10-A	-	117	-	-	-	ONE BLOW/2.5'
(CH)	SOFT, GRAY CLAY W/ CORAL FRAGMENTS & SAND	10		10-B	-	41	-	-	-	TWO BLOWS/FT.
				10-C	-	50 44	-	-	-	
	DENSE, BLACK, SILTY SAND			10-D	-	30	-	-	-	
		20		10-E	-	27	-	-	-	56
				10-F	-	27	-	-	-	54
(CH)	MEDIUM, GRAY & BROWN CLAY	30		10-G	-	38 51	-	-	-	
	CORAL			10-H	NO RECOVERY					20/0"
		40		10-I	-	20	-	-	-	55
				10-J	-	43	-	-	-	
(GM)	WHITE, CORAL & SILTY SAND	50								
				10-K	-	26	-	-	-	
		60								
				10-L	-	16	-	-	-	
		70								
	END OF BORING @ 75.5'			10-M	CORAL FRAGMENTS					63/5'
	** Elevation Estimated from Tide Chart	80								

MUD W/ T.C. DRAG CHOPPING BIT

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log TRANS-MARINA ROAD

PROJECT BRIDGE - PHASE II

LOCATION HAWAII KAI, OAHU, HAWAII

TMK: 3-9-08:1

HAMMER:

Weight 140#

Drop 30"

SAMPLER: 2" DIA. BLUNT POINT

BORING NO. 11 Sheet No. ____ of ____

Driller WALTER LUM ASSOC. Date APRIL 25, 1970

Field Party SUZUKI, MAKAULA, OSHIRO

Type of Boring CONTINUOUS PENETRATION Diam. 2"

Elev. -4'± ** Datum M.S.L.

Drill Bit ____

Water Level	+3.0'				
Time	8:15AM				
Date	4-25-70				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	WATER (VARIES W/ TIDE) ELEV. = -4'± **	0								1 BLOW/ 2.5'
										2 BLOWS / FT
										2 BLOWS / 1.5'
										1 BLOW / 1.5'
		10								1 BLOW / FT
										2 BLOWS / FT
										32
										38
	END OF PENETRATION @ 21'	20								91

** Elevation Estimated from Tide Chart

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.

MARINA 2-C

3-B

MARINA 4

KALUANUI SUBDIVISION 3

HAWAII KAI DRIVE

FREEWAY

ROAD SECTION (PHASE 2)

PROPOSED BRIDGE

B-1 B-4 B-5 B-7 B-10 B-11 B-8 B-9 B-10 B-11 B-12 B-13

MARINA BUSINESS CENTER #1

USINESS CENTER #2

N
SCALE 1" = 200'

LEGEND

- ⊕ BORING FOR THIS PROJECT
- ⊕ BORING } FROM "TRANS-MARINA ROAD BRIDGE PHASE II" REPORT DATED JULY 21, 1970
- • CONTINUOUS PENETRATION TEST }

FIGURE 1

BORING LOCATION PLAN
TRANS-MARINA ROAD - PHASE II
HAWAII-KAI, OAHU, HAWAII
T.M.K : 3-9-08:1

Dr. BW
Date 4/70
Rev.

WALTER LUM ASSOCIATES, INC.
3030 WAIALAE AVE.
CIVIL ENGINEERS
PHONE 737-7931

Sheet
of